AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A droplet ejection apparatus having a driving circuit and a plurality of droplet ejection heads, each of the droplet ejection heads including a cavity filled with a liquid, a nozzle ~~communicated~~ communicating with the cavity, an actuator driven by the driving circuit, and a diaphragm displaced by the actuator, the droplet ejection head ejecting the liquid within the cavity through the nozzle in the form of droplets by driving the actuator with the driving circuit, the droplet ejection apparatus comprising:

a main power supply ~~for supplying a~~that supplies power to the apparatus;

a power cutoff detecting ~~means~~ unit ~~for detecting~~that detects cutoff of the main power supply;

a standby power supply which supplies a power to the apparatus when the power cutoff detecting ~~means~~ unit detects the cutoff of the main power supply;

a residual vibration detecting ~~means~~ unit ~~for detecting~~that detects a residual vibration of the diaphragm displaced by the driving of the actuator;

a storage ~~means~~ unit ~~for storing~~that stores at least one of a vibration pattern of the residual vibration of the diaphragm detected by the residual vibration detecting ~~means~~ unit and~~and/or~~ information obtained from the vibration pattern; and

an ejection failure detecting ~~means~~ unit ~~for detecting~~that detects an ejection failure of the droplet ejection heads and a cause thereof;

wherein the droplet ejection apparatus is constructed so that, when the cutoff of the main power supply is detected by the power cutoff detecting ~~means~~ unit, the actuator is driven by the driving circuit, the residual vibration detecting ~~means~~ unit detects the residual vibration of the diaphragm displaced by the driving of the actuator, and the storage ~~means~~ unit stores the at least one of the vibration pattern of the residual vibration of the diaphragm detected by the residual vibration detecting ~~means~~ unit and~~and/or~~ the information obtained from the vibration pattern, and wherein the ejection failure detecting ~~means~~ unit includes~~include~~ an oscillation circuit that oscillates in response to an electric capacitance component that varies with the residual vibration of the diaphragm;

wherein, when the cutoff of the main power supply is detected by the power cutoff detecting ~~means~~ unit, the ejection failure detecting ~~means~~ unit detects an ejection failure of the droplet ejection heads and the cause thereof based on ~~the basis of~~ the vibration pattern of the residual vibration of the diaphragm, and the storage ~~means~~ unit stores the detection result as the information obtained from the vibration pattern;

wherein the vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration; and

wherein the ejection failure detecting ~~means~~ unit judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual

vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold.

2. (Currently Amended) The droplet ejection apparatus as claimed in claim 1, wherein the residual vibration of the diaphragm detected by the residual vibration detecting ~~means~~ unit is a residual vibration of the diaphragm when the actuator is driven by the driving circuit to such an extent that a droplet is not ejected.

3 – 21 (cancelled)

22. (Currently Amended) The droplet ejection apparatus as claimed in claim 1, further comprising a recovery ~~means~~ unit ~~for carrying~~that carries out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure; wherein, when the main power supply is switched on after the cutoff of the main power supply is detected by the power cutoff detecting ~~means~~ unit, the recovery ~~means~~ unit carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage ~~means~~ unit.

23 - 34 (cancelled).

35. (Currently Amended) The droplet ejection apparatus as claimed in claim 1, wherein the recovery ~~means~~ unit includes: a wiping ~~means~~ unit ~~for carrying~~that carries out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper; a flushing ~~means~~ unit ~~for carrying~~that carries out a flushing process by which the droplets are preliminarily ejected through the nozzles of the droplet ejection heads by driving the actuator; and a pumping ~~means~~ unit ~~for carrying~~that carries out a pump-suction process with the use of a pump connected to a cap that covers the nozzle surface of the droplet ejection heads.

36. (Currently Amended) The droplet ejection apparatus as claimed in claim 1, wherein the recovery ~~means~~ unit carries out the pump-suction process in the case where the cause of the ejection failure of the droplet ejection heads is intrusion of an air bubble into the cavity.

37. (Currently Amended) The droplet ejection apparatus as claimed in claim 1, wherein the recovery ~~means~~ unit carries out at least the wiping process in the case where the cause of the ejection failure of the droplet ejection heads is adhesion of paper dust in the vicinity of an outlet of the nozzle.

38. (Currently Amended) The droplet ejection apparatus as claimed in claim 1, wherein the recovery ~~means~~ unit carries out at least one of the flushing process and~~or~~ the pump-suction process in the case where that the cause of the ejection failure of the

droplet ejection heads is thickening of the liquid in the vicinity of the nozzle due to drying.

39. (cancelled)

40. (Previously presented) The droplet ejection apparatus as claimed in claim 1, wherein the actuator includes the electric capacitance component that varies with the residual vibration of the diaphragm.

41. (Currently Amended) The droplet ejection apparatus as claimed in claim 40, wherein the ejection failure detecting ~~means~~ unit includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element.

42. (Currently Amended) The droplet ejection apparatus as claimed in claim 40, wherein the ejection failure detecting ~~means~~ unit includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit.

43 - 46 (cancelled).

47. (Previously presented) The droplet ejection apparatus as claimed in claim 1, wherein the actuator includes an electrostatic actuator.

48. (Previously presented) The droplet ejection apparatus as claimed in claim 1, wherein the actuator includes a piezoelectric actuator having a piezoelectric element and using a piezoelectric effect of the piezoelectric element.

49. (Previously presented) The droplet ejection apparatus as claimed in claim 1, wherein the actuator includes a film boiling actuator provided with a heating element that generates heat by conducting an electric current thereto.

50. (Previously presented) The droplet ejection apparatus as claimed in claim 1, wherein the diaphragm deforms elastically so as to follow a change in the internal pressure of the cavity.

51. (Previously presented) The droplet ejection apparatus as claimed in claim 1, wherein the droplet ejection apparatus includes an ink jet printer.

52. (Currently Amended) A droplet ejection apparatus having a driving circuit and a plurality of droplet ejection heads, each of the droplet ejection heads including a cavity filled with a liquid, a nozzle ~~communicated~~ communicating with the cavity, an actuator driven by the driving circuit, and a diaphragm displaced by the actuator, the droplet ejection head ejecting the liquid within the cavity through the nozzle in the form of

droplets by driving the actuator with the driving circuit, the droplet ejection apparatus comprising:

a main power supply ~~for supplying a~~that supplies power to the apparatus;

a power cutoff detecting ~~means unit for detecting~~ that detects cutoff of the main power supply;

a standby power supply which supplies a power to the apparatus when the power cutoff detecting ~~means~~ unit detects the cutoff of the main power supply;

a residual vibration detecting ~~means unit for detecting~~that detects a residual vibration of the diaphragm displaced by the driving of the actuator;

a storage ~~means unit for storing~~that stores at least one of a vibration pattern of the residual vibration of the diaphragm detected by the residual vibration detecting ~~means~~ unit and~~and/or~~ information obtained from the vibration pattern;

an ejection failure detecting ~~means unit for detecting~~that detects an ejection failure of the droplet ejection heads and a cause thereof; and

a recovery ~~means unit for carrying~~that carries out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure detected by the ejection failure detecting ~~means~~ unit to eliminate the cause of the ejection failure;

wherein the droplet ejection apparatus is constructed so that, when the cutoff of the main power supply is detected by the power cutoff detecting ~~means~~ unit, the actuator is driven by the driving circuit, the residual vibration detecting ~~means~~ unit detects the residual vibration of the diaphragm displaced by the driving of the actuator, the storage ~~means~~ unit stores the at least one of the vibration pattern of the residual vibration of the diaphragm detected by the residual vibration detecting ~~means~~ unit and

~~and/or~~ the information obtained from the vibration pattern, the ejection failure detecting ~~means~~ unit detects an ejection failure of the droplet ejection heads and the cause thereof based on ~~the basis of~~ the vibration pattern of the residual vibration of the diaphragm, and the storage ~~means~~ unit stores the detection result as the information obtained from the vibration pattern, wherein the driving of the actuator, the detection of the residual vibration, the storage of the vibration pattern of the residual vibration, and the detection of the ejection failure and the cause thereof are carried out based on the power supplied from the standby power supply, and

wherein the vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration, and the ejection failure detecting ~~means~~ unit judges that an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold.

53. (Currently Amended) The droplet ejection apparatus as claimed in claim 52, wherein, when the main power supply is switched on after the cutoff of the main power supply is detected by the power cutoff detecting ~~means~~ unit, the recovery ~~means~~ unit carries out the recovery processing for the droplet ejection heads in accordance with the

cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage ~~means~~ unit.

54. (Currently Amended) The droplet ejection apparatus as claimed in claim 53, wherein the recovery ~~means~~ unit includes: a wiping ~~means~~ unit ~~for carrying~~that carries out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper; a flushing ~~means~~ unit ~~for carrying~~that carries out a flushing process by which the droplets are preliminarily ejected through the nozzles of the droplet ejection heads by driving the actuator; and a pumping ~~means~~ unit ~~for carrying~~that carries out a pump suction process with the use of a pump connected to a cap that covers the nozzle surface of the droplet ejection heads.

55. (Currently Amended) The droplet ejection apparatus as claimed in claim 54, wherein the recovery ~~means~~ unit carries out the pump suction process in the case where the cause of the ejection failure of the droplet ejection heads is intrusion of an air bubble into the cavity.

56. (Currently Amended) The droplet ejection apparatus as claimed in claim 54, wherein the recovery ~~means~~ unit carries out at least the wiping process in the case where the cause of the ejection failure of the droplet ejection heads is adhesion of paper dust in the vicinity of an outlet of the nozzle.

57. (Currently Amended) The droplet ejection apparatus as claimed in claim 54, wherein the recovery ~~means~~ unit carries out at least one of the flushing process ~~or~~ and the pump suction process in the case where that the cause of the ejection failure of the droplet ejection heads is thickening of the liquid in the vicinity of the nozzle due to drying.

58. (cancelled).

59. (Currently Amended) The droplet ejection apparatus as claimed in claim 52, wherein the residual vibration of the diaphragm detected by the residual vibration detecting ~~means~~ unit is a residual vibration of the diaphragm when the actuator is driven by the driving circuit to such an extent that a droplet is not ejected.